# Boulder Creek Restoration Project

## Rare Plants Report

**Prepared by:**
Jennifer Costich-Thompson
IPNF North Zone Botanist

**for:**
Bonners Ferry Ranger District
Idaho Panhandle National Forests

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# Introduction

This report discusses the environmental effects of implementing the Boulder Creek Restoration Project (BCRP) on threatened, endangered and sensitive plants, collectively called "rare plants". A summary of this report is included as part of the Affected Environment and Environmental Consequences section of the Environmental Assessment (EA.)

Rare plants are not directly related to the purpose and need for the project; however, some of the high elevation burning identified as part of the project may benefit whitebark pine (a Region One sensitive plant species).

# Relevant Laws, Regulations, and Policy

## Regulatory Framework

### Land and Resource Management Plan

The Idaho Panhandle National Forest Land and Resource Management Plan (forest plan) provides standards and guidelines for protection and population viability of federally listed and regionally listed plant species.

- FW-GDL-VEG-07. Evaluate proposed management activities and project areas for the presence of occupied or suitable habitat for any plant species listed under the Endangered Species Act or on the regional sensitive species list. If needed, based on pre-field review, conduct field surveys and provide mitigation or protection to maintain occurrences or habitats that are important for species sustainability.

#### *Management Area*

The Hunt Girl Creek Research Natural Area (RNA), which is managed as Management Area 4A, occurs within the BCRP project boundary. Although MA4a direction does not directly relate to rare plant species, several rare plant species are present within the Hunt Girl Creek RNA, and most management activities are precluded from occurrence within MA4a unless expressly authorized in the RNA establishment record.

The remaining management areas within the BCRP area are MA5 (Backcountry) and MA6 (General Forest). None of these management areas have specific guidance related to rare plants; however, all three management areas within the BCRP area are governed by the over-arching guideline (FW-GDL-VEG-07) described above.

### Federal Law

Federal legislation, regulations, policy, and direction require protection of species and population viability, evaluation and planning-process consideration of threatened, endangered, and other rare plant species. The regulatory framework for these plants includes the Endangered Species Act (1973) as amended; the National Forest Management Act (NFMA) (1976); the National Environmental Policy Act (1969); Forest Service Manual (2672.1-2672.43); Idaho Panhandle National Forests (IPNF) Forest Plan (1987); and direction from the Regional Watershed, Wildlife, Fisheries and Rare Plants (WWFRP) program and Washington Office.

# Methodology

The Idaho Panhandle National Forests (IPNF) North Zone Botanist assessed rare plants and potentially suitable habitat for rare plant occurrences through review of Idaho Department of Fish and Game Conservation Data Center element occurrence records (ICDC 2015), National Wetlands Inventory maps, queries of the forest stand and forest activities database (FACTS), National Resource Information System (NRIS), aerial photographs, topographical maps, rare plant surveys completed in 2013, 2014, and 2015.

#### *Pre-field Review*

Pre-field review provides information about the project area that is used to determine the need and extent of field surveys for a project. The North Zone Botanist conducted pre-field review of the proposed analysis area in 2013 and 2014. Queries of the forest activities database (FACTS) were used to provide a "coarse-filter" assessment of suitable rare plant habitat in the project area. Aerial photographs and National Wetlands Inventory maps were also reviewed to identify potentially suitable rare plant habitat.

Rare plants may be assigned to one or more rare plant “habitat guilds.” These guilds are artificial groupings based on similar habitat requirements of two or more rare plant species and are used for analysis, as well as coarse-filter assessments. Rare plant guilds, which can be found on the North Zone of the Idaho Panhandle National Forests, include aquatic, deciduous riparian, peatland, wet forest, moist forest, dry forest, cold forest and subalpine. A list of habitat guild descriptions is included with the sensitive species list in the project file.

The coarse-filter assessment helps to guide rare plant surveys by identifying the areas with the highest potential to support rare plants in the different habitat guilds. Because the query is based in part on habitat type at the forest stand level, it tends to overestimate the actual amount of suitable habitat that occurs in an area. Conversely, microsites of suitable habitat are not identified by using the query alone. Therefore, review of stand examination plot information, aerial photographs, topographical maps and National Wetlands Inventory maps also help to guide rare plant surveys. Field botanists then use this information to perform “controlled intuitive” surveys of the project area, in which they walk through proposed treatment areas or focus areas to validate the habitat assessments of the coarse-filter query. When areas of suitable habitat are confirmed or identified, botanists then intensively survey these areas.

## Incomplete and Unavailable Information

As project botanist, I believe I had complete information about the project area available to me for this analysis and assessment of rare plants within the BCRP area.

## Spatial and Temporal Context for Effects Analysis

### Direct/Indirect Effects Boundaries

The spatial boundaries for analyzing the direct and indirect effects to rare plants are generally the area (habitat) immediately around any rare plant individual or population, within a proposed treatment area. Generally, this immediate area is within 300 feet of any occurrence, because rare plants would primarily either be directly affected by some activity (injury or mortality) or would be indirectly affected by an activity by the subsequent changes to sunlight, water availability or water table, or by influences to soils, either chemical (nutrient or mycorrhizal associations) or physical (porosity/texture). Usually indirect influences such as these become difficult to measure beyond one or two tree lengths distance from a rare plant occurrence.

The temporal boundaries for analyzing the short-term direct and indirect effects to rare plants and suitable rare plant habitats is generally ten years following completion of harvest or other activities, or, in the event of selection of the no-action alternative, ten years after the date of signing the decision document. Beyond ten years, the likelihood of events or activities affecting rare plants and suitable habitat would be difficult to predict. Generally, long-term effects to rare plants or their suitable habitat would be considered anything longer than ten years.

### Cumulative Effects Boundaries

The spatial boundaries for analyzing the cumulative effects to rare plants is generally considered to be the hydrologic boundaries (sub-basin watershed) in which a plant or population resides and in which activities are proposed to occur. For the BCRP project, the cumulative effects analysis area for rare plants will be the Boulder Creek watershed. This area represents the likely limit of effects to rare plant populations from implementation of the action alternatives. Those limits are largely based on the expected distance of spore or seed dispersal and potential for colonization of rare plant populations in areas of suitable habitat, as well as likely extent of indirect effects to rare plant populations or habitat in the analysis area. While patterns of dispersal are not known with certainty for many plant species, in studies of *Botrychium virginianum* most spores fell within 3 meters of the source plant (Peck et al. 1990). Other sensitive species' seeds that are heavier than *Botrychium* spores might be assumed to have similar if not more restricted dispersal patterns.

For the same reasons, analysis includes not only areas proposed for timber harvest and prescribed burning activities, but also the areas proposed for ground disturbance as part of proposed road decommissioning, reconstruction, maintenance, and recreation improvements associated with the BCRP activities.

The temporal boundaries for analyzing the cumulative effects are the same as those time periods described for direct and indirect effects.

Effects to rare plant species and suitable habitat from proposed activities are generally described as very low, low, moderate or high, with the following definitions:

- ***very low*** = no measurable effect on individuals, populations or habitat
- ***low*** = individuals, populations and/or habitat not likely affected
- ***moderate*** = individuals and/or habitat may be affected, but populations would not be affected, and habitat capability would not over the long term be reduced below a level that could support sensitive plant species

- ***high*** = populations would likely be affected and/or habitat capability may over the long term be reduced below a level that could support sensitive plant species

## Resource Indicators and Measures

**Table 1. Resource indicators and measures for assessing effects to rare plants**

| Resource Element | Resource Indicator | Measure (Quantify if possible) | Used to address: P/N, or key issue? | Source (Forest plan S/G; law or policy, BMPs, etc.)? |
|---|---|---|---|---|
| Rare plants | Rare plant occurrences and sustainability | Number of occurrences affected | No | Forest Plan, Design Features |
| Rare plants | Soil structure or soil microbial health | Acres of soil disturbance | No | BMPs |
| Rare plants | Changes to forest canopy cover/ successional stages | Acres of change of forest canopy cover or successional stages | No | BMPs, Design Features |

# Affected Environment

## Existing Condition

### *Suitable Rare Plant Habitat in the Project Area*

Several plant habitats are located within the BCRP planning area, as indicated by the coarse filter query of existing vegetation information. However, most of the proposed treatment areas are currently not suitable rare plant habitat, as they are now a lodgepole pine-dominated forest cover type. Some of the areas would be classified as potentially suitable habitat for moist forest or cold forest habitat guild associates, and only small areas within the proposed treatment areas were identified as potentially suitable dry forest habitat or subalpine forest habitat. No other rare plant habitat guilds were pre-identified as within proposed treatment areas.

### *Previously Documented Rare Plants in the Project Area*

Past surveys by Forest Service personnel (ICDC 2015) have documented scattered rare plant occurrences on National Forest System (NFS) lands within the project area. The following species were known to occur near the project area before surveys for the BCRP project were conducted:

**Moist Forest Habitat Guild species:** *Botrychium lanceolatum* ssp. *lanceolatum, B. minganense*, and *B. pinnatum.* Seven total occurrences of these species are scattered near the project area. Moist forest habitat that could support them occurs within several proposed treatment units.

**Subalpine/ Cold Forest Habitat Guild species:** *Pinus albicaulis* is known to occur from the ridgelines around Clifty Mountain, near the northern project boundary.

**Peatland Guild species:** *Trientalis europaea* is known to occur from within scattered small peatlands associated with the Boulder meadows.

### *Field Survey Results*

Rare plant field surveys were conducted for this project in 2013, 2014, and 2015. Intensive surveys targeted highly suitable habitat identified during the coarse filter assessment within or adjacent to proposed harvest units and roads proposed for use during the project. Cursory surveys were then conducted to assess the potential for sensitive plant occurrence and to identify small microsites that could support sensitive plant species in other proposed activity areas with less suitable habitat, as well as within those areas on NFS lands lacking adequate vegetation data to make pre-field determinations of habitat suitability. All roads proposed for decommissioning, storage, reconstruction, as well as areas proposed for new road construction, were also surveyed. Wherever areas of suitable habitat were confirmed or identified, botanists and technicians then intensively surveyed these areas, using controlled, intuitive methods.

The proposed treatment areas were confirmed as providing no suitable aquatic, peatland, or deciduous riparian rare plant habitat. Some areas within proposed treatment areas were identified as either moist forest habitat (potentially capable of supporting wet forest guild species, moist forest guild species such as *Botrychium* species), dry forest habitat (potentially capable of supporting species such as *Orobanche pinorum*), or cold forest or subalpine habitat (potentially capable of supporting species such as *Pinus albicaulis* or *Lycopodium dendroideum.*) Some areas in the general project area, but outside areas proposed for treatment, were also identified as deciduous riparian habitat (potentially capable of supporting species such as *Betula pumila* v.*glandulifera*), as well as microsites of peatland habitat (capable of supporting *Trientalis europaea.*)

### *Newly-Documented Rare Plants in the Project Area*

During intensive floristic surveys, new occurrences of whitebark pine (*Pinus albicaulis*) were identified on ridgelines, sub-ridges, and upper slopes near Clifty Mountain, Iron Mountain, and Boulder Mountain. As a result, these populations would be buffered from project activities, as feasible.

During the field surveys six new occurrences of *Botrychium* species (four occurrences *B. minganense,* one occurrence *B. pinnatum,* and one occurrence *B. viride- B. lanceolatum* v. *lanceoloatum*) were also identified in association with intermittent stream channels and seepy areas. Although originally within proposed treatment areas, these occurrences will be buffered out of activity areas both because of their identification and also due to general design features excluding treatment within riparian habitat conservation areas (RHCAs.)

Additionally, one new occurrence of ground pine (*Lycopodium dendroideum*) was found adjacent to proposed treatment areas, but will be buffered and excluded from activities to protect the population.

Botanists found that most of the proposed treatment units have low potential to support rare plants; however, some units contain previously unidentified microsites of highly suitable habitat particularly in seeps, depressions, and small draws. Most of these microsites of highly suitable habitat would also be buffered or dropped from proposed activities, due to their association with RHCAs.

Complete results of the field surveys are included in the project file.

### *Species Screen*

The Council on Environmental Quality (40 CFR 1502.2) directs that impacts be discussed in proportion to their significance. Table 1 below displays the level of analysis for rare plants, based upon their potential for occurrence within, or potential for direct effects from, the BCRP proposed activities.

**Table 2. Rare plants and habitat guilds analyzed**

| | No detailed discussion and analysis is necessary for species or habitat not present within the project area. Rationale for no further analysis for these species is in the project file. | Supporting rationale is presented in this section for those species and/or habitat present in the project area, but not affected by the proposed activities or no action. No detailed discussion or analysis is necessary. | Species and/or habitat considered present and potentially affected by the proposed activities or no action are carried forward into a detailed discussion and analysis. |
|---|---|---|---|
| **Federally Listed Species** | | | |
| *Howellia aquatilis* | X | | |
| *Silene spaldingii* | X | | |
| **Region 1 Sensitive Species/ IPNF - Forest Species of Concern** | | | |
| Deciduous riparian guild species | | X | |
| Peatland guild species | | X | |
| Aquatic guild species | X | | |
| Subalpine guild species | | | X |
| Cold forest guild species | | | X |
| *Lycopodium dendroideum* | | | X |
| Wet forest guild habitat | | X | |
| Moist forest guild habitat | | | X |
| *Botrychium* species | | | X |
| Dry forest guild species | | | X |

Species or habitat considered present and/or potentially affected by the proposed activities are carried forward into a detailed discussion and analysis in the Environmental Consequences Section.

# Environmental Consequences

## Alternative 2 – Proposed Action

The BCRP proposes to treat about 9 percent of the forest stands (3,433 acres) in the project area using commercial harvest and 18 percent (7,407 acres) using prescribed fire only. Of the commercial harvest acres, approximately 2,872 acres would be harvested as a "Seed-tree harvest with reserves" (regeneration harvest); 127 acres would be harvested as "Shelterwood harvest with reserves" (regeneration harvest); and 434 acres would be harvested as a "Group Selection harvest" (thinning/intermediate harvest).

In inaccessible areas of the project, located primarily in roadless areas, prescribed burning would be used on about 7,400 acres to create a mosaic of openings in the forest canopy, reduce fuel loading and continuity across the landscape, and return the role of fire back into the local ecosystem.

We propose about 76 miles of road maintenance and reconstruction, 3.2 miles of temporary road construction, 13.4 miles of road storage, and 0.7 mile of road decommissioning. In order to improve access to the River Walk trailhead we propose to change the closure period to April 1 through June 15 for Road 2209. We also propose to treat weed populations along trailheads and roads within the project planning area using USFS approved herbicides and weed management practices.

Trail management includes improving turnarounds and parking at six trailheads. Road 1304G is proposed for storage. We propose to store this road and convert its surface to a non-motorized biking trail, which will serve as an additional single track access to Trail 51. Other recreational improvements include an interpretive trail at the Boulder City ghost town (site 10BR0027), a toilet, and a parking lot to support the increasing recreational pressure this area receives.

Logging equipment used to implement the harvest would include ground based equipment on 1,862 acres, skyline machinery on 631 acres, a combination of ground based and skyline on 595 acres, and helicopter on 345 acres. Fuels reduction treatments would occur in the 3,433 acres of commercial harvest units using grapple piling and prescribed fire. About 800 acres of precommercial thinning is also proposed that would be carried out using chainsaws. Precommercial thinning would not result in any biomass removal. The prescribed burning would reduce the amount logging slash, prepare the areas for seedlings and stimulate browse plants for wildlife. A fuel break 22 acres in size would also be implemented on Black Mountain below the lookout.

## Alternative 3

Alternative 3 is composed of the same proposed actions as in alternative 2, less any activities in the Inventoried Roadless Areas (IRAs). The only activities therefore reduced within Alternative 3 are prescribed burning, which would be reduced from 7,407 acres proposed in Alternative 2 to only 172 acres of prescribed burn only treatments in Alternative 3.

## Project Design Features and Mitigation Measures

1. A qualified botanist would assist with project layout as necessary to ensure protection of documented rare plant populations and microsites of highly suitable habitat. Any changes to the selected alternative that may occur during layout would be reviewed by the North Zone Botanist, and rare plant surveys would be conducted as necessary prior to project implementation. Newly documented occurrences would be evaluated, with specific protection measures implemented to protect population viability. Such measures could include the following:

2. Microsites of highly suitable rare plant habitat that occur within proposed treatment units, including seeps, springs and other seasonally or perennially wet areas, would be protected from all project activities by site-specific buffers established by a qualified botanist.

3. Any changes to the proposed action that may occur during layout would be reviewed by a qualified botanist, and rare plant surveys would be conducted as necessary prior to project implementation. Newly documented occurrences would be evaluated, with specific protection measures implemented to protect population viability. Such measures could include the following:

    a. Dropping units from harvest activity;

    b. Modifying unit boundaries to provide adequate buffers around documented occurrences, as determined by a qualified botanist and based on topography, extent of contiguous suitable habitat for documented occurrences and the type of treatment proposed;

    c. Modifying harvest methods, fuels treatment or logging systems to protect rare plants and their habitats; and/or

d. Implementing, if necessary, Timber Sale Contract provisions B6.24, Protection Measures Needed for Plants, Animals, Cultural Resources, and Cave Resources; C6.24#- Site Specific Special Protection Measures; and B8.33, Contract Suspension and Modification.

4. All documented rare plant occurrences would be protected from timber harvest activities by site-specific buffers established by a qualified botanist. Specifically, several R1 Sensitive Plants or IPNF Forest Species of Concern were found, including occurrences of multiple moonwort species (*Botrychium* species), as well as ground pine (*Lycopodium dendroideum*) were located within proposed activity areas. As a result, these documented rare plant locations will be appropriately protected or buffered from any planned activities, as determined by a qualified botanist.

## Effects Common to All Alternatives (1, 2, and 3)

### Threatened and Endangered Species

#### *Direct Effects*

No endangered plant species are suspected to occur in the IPNF, and no threatened plant species are suspected to occur in Boundary County, Idaho, in which this project is located (USDI 2017.) Furthermore, proposed activity areas in the BCRP project were field surveyed in 2013, 2014, and 2015, and neither occurrences of, nor habitat for, threatened or endangered plants were found. Therefore, this project would result in no direct or indirect effects to any federally listed plant species, regardless of alternative selection.

#### *Cumulative Effects*

Because no direct or indirect effects would occur to any federally listed species (see above), there would be no cumulative effects to populations or suitable habitat for federally listed species from implementation of any of the three alternatives for the BCRP.

## Alternative 1 – No Action

This section describes the predicted effects to rare plants specific to Alternative 1 (No Action) of the BCRP.

### Sensitive Plants and Forest Species of Concern

#### *Direct and Indirect Effects*

Management activities would not change from current levels, and current vegetation trends would be expected to continue. Because there would be no new road construction, timber harvest or underburning with the no action alternative, there would be the potential for ***very low*** direct impacts to rare plants or their habitat.

Indirectly, the continued increase in forest fuel loading resulting from no management could pose a threat to suitable rare plant habitat in the context of a higher risk of stand replacing fires in the future. Such fires could extirpate the documented occurrences and/or undetected rare moonworts and other rare plants in the project area, particularly those associated with moist forest habitat. Habitat suitability for rare moonworts may be reduced if fire intensity is sufficient to destroy soil mycorrhizae on which these species depend (Allen 1991). In addition, oceanspray, the preferred host plant for pine broomrape, could be at least temporarily reduced in cover by a high-intensity fire (Crane and Fischer 1986).

### *Cumulative Effects*

When combined with the following past, current and ongoing activities and events, no action has potential cumulative effects to rare plants that differ from those of Alternatives 2 and 3. All other cumulative effects of this alternative are discussed above under "Effects Common to Alternatives 1, 2, and 3."

**Past Activities and Events**

Past wildfire suppression in the project area has increased the risk of severe stand-replacing fires. Implementation of no action would not address the accumulated forest fuels in the project area.

**Current and Ongoing Activities**

Ongoing wildfire suppression in the project area would increase the probability of severe stand-replacing fires. Implementation of no action would contribute to the continued accumulation of forest fuels in the project area.

### *Determination of Cumulative Effects Resulting from Alternative 1 (No Action)*

When combined with the effects of past and ongoing fire suppression, implementation of no action would further increase the risk of severe stand replacing fires (see Fuels report.) Should such a fire occur, it may impact populations and/or reduce habitat suitability for rare moonworts and pine broomrape, at least temporarily. ***No action could result in low, moderate, or high cumulative effects*** to these species and/or moist forest or dry forest habitats, depending on where a fire occurs and the severity or intensity of the fire. However, the occurrence and intensity of a future wildfire in suitable habitat for these species would be difficult to predict.

## Effects Common to Alternative 2 and Alternative 3

This section describes the predicted effects to rare plants common to both action alternatives for the BCRP, including Alternative 2 (Proposed Action) and Alternative 3.

With implementation of either of these action alternatives, timber harvest, precommercial thinning, underburning (prescribed burning), and road maintenance/ reconstruction/storage/ decommissioning will occur (approximately 11,640 acres of total treatment in Alternative 2 and 4,405 acres in Alternative 3, respectively.) Although the acreage totals of activities varies between alternative, the potential for direct and indirect effects are similar between the two alternatives and are described below. Because timber harvest and prescribed burning often results in significant changes to canopy cover, as well as the potential for soil disturbance (both issue indicators), those impacts are described.

### Sensitive Plants and Forest Species of Concern

#### *Direct and Indirect Effects*

**Silvicultural Treatment Prescriptions**

Silvicultural treatments are those activities designed to manipulate the forest stands to meet certain objectives. Often, activities are non-commercial (as in pruning, precommercial thinning of seedling and sapling stands, or burning); however, many of the silvicultural activities described below are generally considered commercial because the by-product of this management can be commercially harvested as timber.

Regeneration harvests generally remove most of the overstory or larger trees in the forest canopy, resulting in increased solar insolation on the forest floor following harvest. This silvicultural treatment produces significant canopy openings, usually while retaining scattered overstory trees and residual patches of trees. Under either action alternative, some scattered trees and patches would be retained even

within regeneration harvest areas, to reduce impacts to the visual resource or to provide seed stock or shelter to the next forest stand. Regeneration harvest activities generally result in conversion of ecological succession back to early-seral (or pioneer-type) species for that given habitat. Because these treatment types result in significant changes to canopy cover, these treatments could result in a moderate risk of direct effects to rare plant individuals and temporarily to habitat suitability for rare plants, particularly those rare plants in the moist forest or wet forest habitats.

In comparison, intermediate or thinning harvest types (also referred to as uneven-aged management) typically remove less forest canopy cover and therefore result in a lower risk of converting stands to early successional stages because solar insolation on the forest floor is still relatively similar to pre-treatment. Therefore, for plant species that depend upon significant shade (like many of those species in the moist forest and wet forest habitat guilds), regeneration harvests have a longer impact on preferred habitat. However, for some dry forest species which prefer moderate to full sunlight conditions, regeneration harvests may not have significant impacts on species, and intermediate silvicultural treatments (such as thinning) may actually have a positive effect on dry forest dependent rare plant species. Consequently, intermediate harvests typically result in very low risk to rare plant individuals (or suitable habitat for rare plants).

**Logging Systems**

The risk of damage or destruction of rare plant individuals in proposed commercial timber harvest units depends greatly on the type of logging system utilized. The associated risks are present regardless of the potential rare plant habitat in which the logging occurs and are discussed below.

Where logging would be accomplished through hand-falling and yarding would be accomplished with skyline cables, there would be less soil disturbance than with mechanical harvesting and/or ground-based logging or yarding activities. Therefore, the risk of damaging/destroying rare plants would be lower for skyline harvested areas than where ground-based logging would occur. Harvesting and yarding performed when soils are frozen or when snow cover is present also typically result in less soil disturbance than when similar harvests are performed spring through fall seasons. Therefore, "winter" harvesting typically results in reduced potential for direct effects to rare plants compared with timber harvest performed in other seasons.

Ground-based harvest activities would occur under any of the action alternatives. Ground-based harvest could include tractor yarding, tractor with line pulling, tractor swing and cut-to-length. Traditional ground-based logging systems generally have yarding/skidding corridors every 50-100 feet, and trees are generally felled or skidded into the corridors, where equipment yards trees in repeated trips along these corridors to a log landing. Unless performed when soils are frozen or snow-covered, these logging systems often result in moderate to high potential for soil disturbance (including compaction) or displacement, depending upon soil moisture conditions and existing vegetation cover. However, harvester/forwarder ground-based systems do create less soil compaction and displacement because these systems allow for lopping branches in the forest, piling those limbs/tops/slash in front of the equipment, and driving on that slash mat. As a result of any of the action alternatives, there is a moderate risk to rare plant individuals within any habitat guild; however, when ground-based systems are utilized when soils are frozen or snow-covered or when harvester/forwarder systems are operated on slash mats, risk of direct damage or destruction of rare plants can be reduced to low to moderate.

Skyline-harvest activities would also occur under any of the action alternatives. Because skyline yarding typically suspends or partially-suspends logs off of the ground (using a cable system), the impacts on soils by this system are reduced from standard ground-based yarding systems. Skyline yarding typically only creates soil disturbance within corridors, and the disturbance is typically a displacement/rutting of soils as log ends are dragged uphill by the cable system. Thus, risk to rare plants when using this logging system

is generally low and generally would only occur associated with the soil displacement in the skyline (yarding) corridors.

Additionally, there is also potential for some of the proposed units to be harvested using a combination of the above two systems (sometimes referred to as "swing" systems.) Because these systems are literally a combination of part of the units being harvested using ground-based systems and other portions of the units by skyline-yarding systems, the effects to rare plants would be somewhere in between those effects described above. Generally, these systems will result in low to moderate risk to rare plants where ground-based harvest is conducted and low risk to rare plants in skyline-harvest corridors, depending upon soil moisture conditions and existing vegetation cover.

For either type of general logging system, harvest activities on snow or frozen soils, or on slash mats, substantially mitigates risks to soil disturbance; thereby, reducing potential direct effects to rare plants.

**Fuels Treatments**

Following timber harvest, all action alternatives propose a combination of different fuel treatments to dispose of slash and other natural fuels, including underburning, limbing and lopping, as well as excavator (grapple) piling and burning piles. Additionally, all action alternatives propose approximately 662 acres of un-harvested areas be underburned for ecosystem benefit and to improve wildlife browse.

Underburning and prescribed burning would produce vegetation disturbance that might lead to direct effects to (damage or destruction of) individual rare plants, particularly those that occur in moist forest, cold forest, or wet forest habitats. Such burning typically varies in intensity of effects across the landscape. Some areas incur very limited loss of shrub or forest canopy cover, while other areas can result in complete loss of shrub or forest canopy cover.

Prescribed fire has the potential to both directly impact rare plants and also indirectly impact suitable habitat for rare moonworts and other moist forest-, wet forest-, or cold forest- dependent rare plant species. The extent of risk would depend on many factors, including timing of the burn, phenology of the specific plant species involved, depth and moisture content of organic matter (duff), and occurrence of abnormally wet or droughty conditions at the time of the burn.

The risk to rare plants in areas proposed for underburning would vary for different plant communities. Those species which are dependent upon dry forest habitats (such as *Orobanche pinorum*) may be at lower risk, while species which depend upon moist forest habitats may be at higher risk. The risk to rare plant individuals, as well as the risk to potentially suitable habitat for rare plants, depends on the season and severity of the burn in each community type. For example, ninebark sprouts vigorously following a fire and has been found to be more abundant on burned than unburned locations (Noste and Bushey 1987). In that instance, recovery of the shrub component will eventually lead to recovery of habitat suitable for *Orobanche pinorum*. Typically our moist and dry forest habitats within the majority of the BCRP area will be shrub-dominated for 5-25 years following a fire disturbance.

Consumption/destruction of rare plant individuals is possible even when care is taken to implement burning prescriptions. Additionally, for moist forest-dependent species such as *Buxbaumia viridis* which live on dead, woody debris, their habitat may be largely destroyed by fire (at least in the short-term until ecological succession results in large, coarse wood accumulation again.)

There have been a few studies of fire disturbance in *Botrychium* populations. Johnson-Groh and Farrar (1993) found that fire affects the aboveground fronds of *B. simplex*, but the population being studied appeared to be resilient even with particularly hot fires that desiccated the soil. The loss of photosynthetic capacity the year of the fire was considered equivalent to non-emergence for a year, and the fire might be considered a minor disturbance. However, as a secondary effect with other stress disturbances, loss of

population vigor or population decline may result (Johnson-Groh and Farrar 2003, Johnson-Groh and Farrar 1996). While many documented *Botrychium* occurrences show evidence of previous fire, a study of historical documentation of the type and periodicity of such fires has not been undertaken.

Prescribed fires have the potential to emulate wildfire effects but with the advantage of management considerations of scale, timing and intensity. Timing of prescribed fire is essential, with burning recommended either prior to plant emergence or after spore maturity (Weldon et al. 2001, Johnson-Groh and Farrar 1989). In the Kaniksu portion of the Idaho Panhandle National Forests, rare moonworts have been found to emerge aboveground in early to mid-June at the earliest (Hammet, personal observations 1991-2008). This is well after the period in which prescribed spring burning would occur (Lux, personal communication 2006). Conversely, fall burning typically occurs well past spore maturity for most rare moonworts (Hammet personal observations 1991-2008).

In addition, severity of burning can vary across the landscape, sometimes resulting in bare, mineral soil exposure, which generally also equates to loss of rare plant individuals and potentially to temporary loss of habitat. However, mitigation designed to reduce effects to soils will likely minimize bare, mineral soil exposure and severe soil disturbance.

Machine piling would also produce ground disturbance that could damage or destroy rare plant individuals, similar to ground-based harvest activities. However, the spatial extent of those impacts are somewhat reduced from ground-based harvest activities because not all fuels are piled; some slash and debris are left on-site to retain soil productivity.

Required design features as described above and in the BCRP Environmental Assessment would reduce but would not eliminate the risks to rare plants associated with fuels treatments.

**Road Maintenance, Reconstruction, Temporary Road Construction, and/or Storage/ Decommissioning Activities**

Either action alternatives would result in the need for road maintenance, improvement, reconstruction, new temporary road construction, as well as road storage and/or decommissioning activities.

Roadside areas are not generally considered to be highly suitable habitat for rare plants, although a few species do have an affinity for very infrequently-maintained old road prisms. In particular, *Botrychium lanceolatum* ssp. *viride* and *B. pinnatum* have often been documented along unmaintained roads, especially between wheel tracks or along undisturbed cutbanks. Very infrequently, especially near wet forest habitat, *B. minganense* has also been observed. As a result, there is potential that road-maintenance, reconstruction, or storage activities could directly affect (damage or destroy) individual plants of these three moonwort species, or indirectly, soil displacement caused by these road-associated activities could move or bury individual plants. However, these activities would not likely affect the population viability of these species. For most rare plants, such road-associated activities would have no effect.

New temporary road construction, through the action of soil displacement and compaction, has the potential to impact undetected, individual rare plants in whatever habitat it occurs within. However, the loss or impact of individual rare plants is not expected to result in a loss of population viability for any rare plant species.

**Recreation Improvements**

Recreation improvements are proposed within moist forest and wet forest habitats capable of supporting rare plants associated with those habitats; however, no rare plants were detected during surveys of those proposed activity areas. Recreation improvements have the potential to cause direct effects to individual rare plants, either by damage/destruction of individual, undocumented plants or through soil disturbance (displacement and compaction). Recreation improvements also have the potential to indirectly affect rare

plants through soil compaction which could result in changes to soil mycorrhizal associations with rare plants. However, because the soil disturbance caused by recreation improvements would occur at a very small scale, no effects to rare plant population viability are expected.

**Non-native, Invasive Plant (Noxious Weed) Management**

Implementation of either of the BCRP action alternatives (alternatives 2 or 3) would also result in a more thorough weed management strategy for the BCRP area. Weed management activities are proposed within moist forest and wet forest habitats capable of supporting rare plants associated with those habitats; however, no rare plants were detected during surveys of those proposed activity areas. Typically, the majority of weed management (including herbicide treatment) occurs adjacent to road and trail corridors where weeds tend to concentrate and spread. Such weed-infested habitat is not generally considered highly suitable rare plant habitat. However, as discussed in the road management effects, three rare plant species (*Botrychium lanceolatum* ssp. *viride, B. minganense,* and *B. pinnatum*), associated with moist forest habitats in northern Idaho, are often found associated with very infrequently-maintained roads. Therefore, undiscovered individuals of these three rare plant species would have some potential of being directly affected (damaged or destroyed) by herbicide weed treatments. Within the BCRP project, several occurrences of these species were newly-documented during the course of project-related floristic surveys, some near roads but most in forested areas. All known occurrences of rare plants would be protected from project activities; however, some individual plants may be present in the area that were undetected during surveys. Any undetected (and therefore unprotected) individual plants from these species that may be impacted by herbicide treatments would not affect the overall population viability of the species. Other rare plant species are not likely to be affected by roadside and trailside herbicide application.

Other noxious weed management strategies, expected to be implemented with alternatives 2 or 3, include monitoring, rapid response treatments to new invader establishments, and application of biological controls where herbicide treatments would not be efficient or effective and where weed populations are suitable for biocontrol. Monitoring and subsequent rapid response treatments on new invader weed species would likely result in no effects to rare plants because the herbicide treatments are specifically applied to the newly-documented rare plants (often as individual plants or small, newly-established populations.) Biological controls are selected through a rigourous, multi-agency assessment of plant-specificity and efficacy. For instance, the Klamath beetle only eats *Hypericum perforatum,* so it would not have any effects on non-target plants. Conversely, to-date, no biological control has been released for hawkweeds because so far any hawkweed-specific insect pest also has exhibited preferences for our native hawkweed species. The goal of biological controls is control of the desired weedy plant species, with little to no effects to non-target plants. Therefore, application of biological controls associated with implementation of BCRP alternatives 2 or 3 are likely to result in no effects to rare plants.

**Specific Habitat Guild Assessments**

There is no aquatic guild habitat within or adjacent to proposed treatment units or proposed road locations for either action alternative. Because these guilds would not incur ground disturbance or changes in canopy coverage, no direct or indirect impacts would occur to these habitat guilds or species that occur within these guilds as a result of either alternative.

Although there is some deciduous riparian and microsites of peatland rare plant habitat adjacent to the project area, no proposed treatment areas in either Alternative 2 or 3 contain such habitat. Because this guild would not incur ground disturbance or changes to canopy coverage, no direct or indirect impacts would occur to this habitat guild or species that occur within this guild as a result of either alternative.

Moist forest habitat identified in the coarse filter assessment and during surveys was present within proposed treatment areas which could provide suitable potential to support rare plants (specifically

*Botrychium spp.*). The microsites identified which provide highly suitable habitat were adjacent to intermittent streams and seasonally wet areas not previously documented. Six new occurrences of moist forest habitat rare plant species were documented within or adjacent to proposed treatment areas. In addition to those plants identified, undetected individuals and/or some suitable moist forest habitat may be directly impacted by project activities. Ground-based harvest and soil disturbance could disrupt soil mycorrhizae in suitable habitat for rare moonworts. Therefore, the risk of direct effects to rare plants within the **moist** forest habitat guild, as a result of implementing Alternatives 2 or 3, are predicted to be ***low to moderate.***

Indirectly, there could be a risk of prescribed fire impacting suitable habitat for rare moonworts. The extent of risk would depend on many factors, including timing of the burn, phenology of the plant species involved and occurrence of abnormally wet or droughty conditions at the time of the burn.

There have been a few studies of fire disturbance in *Botrychium* populations. Johnson-Groh and Farrar (1993) found that fire affects the aboveground fronds of *B. simplex*, but the population being studied appeared to be resilient even with particularly hot fires that desiccated the soil. The loss of photosynthetic capacity the year of the fire was considered equivalent to non-emergence for a year, and the fire might be considered a minor disturbance. However, as a secondary effect with other stress disturbances, loss of population vigor or population decline may result (Johnson-Groh and Farrar 2003, Johnson-Groh and Farrar 1996). While many documented *Botrychium* occurrences show evidence of previous fire, a study of historical documentation of the type and periodicity of such fires has not been undertaken.

Prescribed fires have the potential to emulate wildfire effects but with the advantage of management considerations of scale, timing and intensity. Timing of prescribed fire is essential, with burning recommended either prior to plant emergence or after spore maturity (Weldon et al. 2001, Johnson-Groh and Farrar 1989). In the Kaniksu portion of the IPNF, rare moonworts have been found to emerge aboveground in early to mid-June at the earliest (Hammet personal observations 1991-2007). This is well after the period in which prescribed spring burning would occur (Lux personal communication 2006). Conversely, fall burning typically occurs well past spore maturity for most rare moonworts (Hammet personal observations 1991-2007).

Based on the best available knowledge, the risk of indirect impacts to rare plants in the moist forest guild, such as undetected rare moonwort individuals, from timber harvest or fuels/slash treatment as proposed under Alternatives 2 or 3 would be ***low to moderate***.

**Dry forest** habitat guild was identified in some lower elevation portions of proposed treatment areas. This dry forest habitat, which also is suitable habitat for **pine broomrape**, occurs within both Alternative 2 and Alternative 3. Although this area was surveyed intensively for dry forest guild rare plants, no pine broomrape (*Orobanche pinorum*) was identified.

Although no populations of pine broomrape were found during surveys, the impacts of the proposed treatments to suitable habitat for this species cannot be predicted with certainty because the species' ecology is poorly understood. However, the proposed treatments in either alternative would likely enhance oceanspray in the lower elevations, which is the preferred host species of pine broomrape. Oceanspray is considered to be well adapted to disturbance by fire, usually responding to a low-intensity burn by root crown and rhizome sprouting (Young 1983). The proposed action under both Alternative 2 and 3 would, to some degree, trend the treated areas toward historical conditions and would reduce the risk of large, stand-replacing fires, which could be more intense and has the potential to destroy root crowns and rhizomes of the host species.

Therefore, the risk of direct effects to rare plants within the **dry forest** habitat guild, as a result of implementing Alternatives 2 or 3, is predicted to be ***low.***

**Cold forest** and **subalpine** forest habitats were identified in the upper elevations and cold drainages proposed for treatments under either action alternative. One occurrence of ground pine and several new sub-populations of whitebark pine were located within suitable cold forest and subalpine habitat. Ground pine is considered a species which has an affinity for cold sites and mid-seral forests. Anecdotal evidence suggests this species can tolerate light disturbance, but not significant soil disturbance or substantial changes to sunlight exposure. Fire generally kills the above ground portions as well as rhizomes in the litter layer, but if underground rhizomes survive, the plant may recover after a burn (Chapman and Crowe 1981).

Because the sites in this project area where this species could occur are lodgepole pine-dominated and those forest stands are starting to transition, there is a high potential for naturally-caused, stand-replacing fire to occur. Proposed treatments vary, but generally would result in regeneration harvest in these lodgepole pine stands, with some variable retention to maintain structural diversity. In addition, following harvest, slash within these stands would be treated either through underburning or grapple-piling and burning. Both these silvicultural and fuels treatments have the potential to substantially alter the habitat conditions for rare plants within the cold forest habitat guild, which could result in some individuals or small populations of previously undetected rare plants being harmed or killed. Based on the best available knowledge, the risk of direct or indirect impacts to rare plants in the cold forest guild, such as undetected ground pine, or their associated habitat, resulting from timber harvest or fuels/slash treatment as proposed under Alternatives 2 or 3 would be ***low to moderate***.

Numerous small sub-populations of whitebark pine (a **subalpine habitat** associated species) were located scattered along ridgelines and upper slopes around the project area. This species has evolved with fire in the Inland Northwest, and although this species is not fire-resistant, fire is beneficial in reforestation of the species and in removing its competition. In some parts of this species' range, Clark's nutcrackers and grizzly bears have been instrumental in ensuring regeneration success of the species. However, an introduced pathogen, white pine blister rust has slowly been killing many whitebark pine in the area. In addition, several years with above-average winter temperatures have enabled mountain pine beetles to reach high population levels. All of these factors have resulted in high mortality rates for whitebark pine, and the whitebark pine in this area are no exception. Most of the trees surveyed were already dying or had fatal blister rust cankers. Only a few whitebark pine appeared healthy and vigorous. All healthy whitebark pine trees would be protected from timber harvest, and underburning. All other whitebark pine trees, including dying trees, would be protected where feasible. Where no whitebark pine are present, but where there is suitable habitat, timber harvest or fuels/slash treatment would not impact habitat suitability. Therefore, impacts to rare plants in the subalpine habitat guild, such as whitebark pine, or their associated habitat, resulting from timber harvest or fuels/slash treatment as proposed under Alternatives 2 or 3 would be ***very low to low***.

### *Cumulative Effects*

The following past activities and events, current and ongoing activities, and reasonably foreseeable actions result in the same cumulative effects when combined with either of the action alternatives.

#### Past Activities and Events

Past wildfires, mining, timber harvest on National Forest System (NFS) lands, as well as road and trail construction or maintenance may have affected rare plants and/or rare plant habitat through ground and vegetation disturbance and canopy removal. Few floristic surveys were conducted on NFS lands before 1990, so the extent of, and an effect on, rare plant populations of older projects is unknown. Timber harvest on National Forest lands after 1990 occurred with protections for rare plants.

Past wildfire suppression in the project area may have increased the risk of severe stand-replacing fires. The proposed treatments would reduce the current fuel loading, thereby reducing the risk of stand-replacing fires.

Timber harvest and residential development on private lands likely affected rare plants and suitable rare plant habitat, although the extent of such effects is unknown.

**Current and Ongoing Activities**

Road, trail and heli-spot maintenance, as well as noxious weed treatment activities associated with roads would occur in areas with low suitability as rare plant habitat. Therefore, no effects to rare plants or suitable habitat are expected to occur.

While wildfire suppression would continue in order to protect adjacent private property values, water quality and other resource values, the proposed treatments in either action alternative would increase the ability to safely use prescribed fire, periodically reduce forest fuel loads, and would increase the ability to suppress unwanted wildfires. Alternative 2 would reduce forest fuels by treating approximately 11,640 acres of NFS lands within the project area; Alternative 3 would reduce forest fuels by treating approximately 4,405 acres of NFS lands within the project area. When combined with either action alternative, ongoing wildfire suppression would decrease the probability of severe stand-replacing fires. There would therefore be a lower risk of severe fire effects to occurrences of and/or suitable habitat for ground pine, whitebark pine, moonworts, and pine broomrape than under no action.

Timber harvest and residential development on private lands may continue to impact rare plants and suitable rare plant habitat, but the effects of such activities are unknown.

**Reasonably Foreseeable Actions**

Noxious weed treatment and monitoring would follow guidelines established in the Bonners Ferry Noxious Weeds Control Project EIS (USDA 1995), as well as those designed in BCRP project proposal design features/mitigation measures. Effects to rare plant species were analyzed in the Bonners Ferry Noxious Weeds Control EIS regarding treatments along specified roads. Effects to rare plant species as a result of the noxious weed control design features and mitigation measures proposed as part of this project would have similar results. Any proposed herbicide spraying for noxious weed control would be localized to severely-infested areas or adjacent to existing or newly-constructed roads. Any biological control agent release would be limited to specific "predators" for the weed species intended. Severely infested noxious weed areas and areas impacted by roads are considered as low suitability habitat for rare plants. No suitable habitat for rare plants would be impacted in the long-term. Furthermore, control or containment of noxious weeds has an indirect effect on rare plants by preventing noxious weed spread into otherwise suitable rare plant habitats. Therefore, although herbicide use for the control of noxious weeds has the potential to directly affect individual plants, cumulative impacts to rare plant species would be ***very low to low***.

### *Determination of Cumulative Effects Common to Alternative 2 and Alternative 3- Related to Timber Harvest, Fuels Treatment, Road Maintenance/Reconstruction, Recreation Improvements, and Non-native Invasive Plant Treatments*

When combined with and considering the above past, present, and reasonably foreseeable activities, Alternatives 2 and 3 would have ***very low to moderate*** cumulative effects to rare plants and/or suitable habitat within the dry forest, moist forest, wet forest, cold forest, and subalpine habitat guilds. Proposed treatment acreages within the different habitats vary slightly between alternatives; however, impacts would be similar, just at different scale. No cumulative impacts to rare plants or habitat in the deciduous riparian, aquatic, or peatland habitat guilds would occur, because these habitats would not incur either direct or indirect effects from either of these action alternatives.

## Summary of Environmental Effects

**Table 3. Summary comparison of environmental effects to rare plants**

| Resource Element | Indicator/Measure | Alt 1 | Alt 2 | Alt 3 |
|---|---|---|---|---|
| Rare plant occurrences and sustainability | Number of occurrences affected | No known rare plant occurrences would be impacted; however, there is potential that undiscovered individuals of triangle (green) or northwestern moonwort may be impacted by ongoing road maintenance. | No recently discovered rare plant occurrences or previously-identified rare plant occurrences would be impacted by Alternative 2, because all known rare plant occurrences would be buffered from project activities. However, there is potential that undetected rare plant individuals within the subalpine, cold, dry, moist, or wet forest habitats could be inadvertently impacted. | No recently discovered rare plant occurrences or previously-identified rare plant occurrences would be impacted by Alternative 3, because all known rare plant occurrences would be buffered from project activities. However, there is potential that undetected rare plant individuals within the subalpine, cold, dry, moist, or wet forest habitats could be inadvertently impacted. |

| Resource Element | Indicator/Measure | Alt 1 | Alt 2 | Alt 3 |
|---|---|---|---|---|
| Soil structure or soil microbial health | Acres of soil disturbance | Very limited impacts to soil disturbance could occur with ongoing road or trail maintenance, as well as recreational facility maintenance. However, such activities would only occur within previously-disturbed sites. | Approximately 3,433 acres of timber harvest (2,457 acres of which would entail ground-based harvest) and 7,407 acres of prescribed burn only treatments. As a result, approximately **9,864** acres would likely be at risk for some soil disturbance, which also means potential for effects to undetected rare plant individuals. In addition, approximately **93.3** miles of road are slated for maintenance, storage, decommissioning, or new temporary construction activities, all of which result in soil disturbance and could affect undetected rare plant individuals. | Approximately 3,433 acres of timber harvest (2,457 acres of which would entail ground-based harvest) and 172 acres of prescribed burn only treatments. As a result, approximately **2,629** acres would likely be at risk for some soil disturbance, which also means potential for effects to undetected rare plant individuals. In addition, approximately **93.3** miles of road are slated for maintenance, storage, decommissioning, or new temporary construction activities, all of which result in soil disturbance and could affect undetected rare plant individuals. |

| Resource Element | Indicator/Measure | Alt 1 | Alt 2 | Alt 3 |
|---|---|---|---|---|
| Changes to forest canopy cover/ successional stages | Acres of change of forest canopy cover or successional stages | No changes to forest canopy cover are expected as a result of the no action alternative. | Approximately 3,433 acres of timber harvest (2,999 acres of which would result in forest regeneration) and 7,407 acres of prescribed burn only would likely result in significant decreases in forest canopy cover for approximately **10,406** acres. As a result, undetected rare plant individuals on these 10,406 acres have the potential to be indirectly and cumulatively affected by changes to forest canopy cover. | Approximately 3,433 acres of timber harvest (2,999 acres of which would result in forest regeneration) and 172 acres of prescribed burn only would likely result in significant decreases in forest canopy cover for approximately **3,171** acres. As a result, undetected rare plant individuals on these 3,171 acres have the potential to be indirectly and cumulatively affected by changes to forest canopy cover. |

# Compliance with the Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The IPNF forest plan management guidelines include "Evaluate proposed management activities and project areas for the presence of occupied or suitable habitat for any plant species listed under the Endangered Species Act or on the regional sensitive species list. If needed, based on pre-field review, conduct field surveys and provide mitigation or protection to maintain occurrences or habitats that are important for species sustainability." (FW-GDL-VEG-07, USDA 2015)

This guideline meets the requirements of the National Forest Management Act (NFMA) of 1976, Section 6(g)(3)(B), by providing for diversity of plant communities based on the suitability and capability of the specific land area. The entire BCRP area and proposed activity areas for all alternatives were assessed by the project botanist and appropriately surveyed for rare plants. Design features to protect all documented occurrences from proposed activities were included as part of the project development, so the IPNF FW-GDL-VEG-07 will be met by implementation of any BCRP alternative.

The forest plan also identifies a desired condition of "Habitat for plant species listed under the Endangered Species Act [ESA] is maintained or restored on NFS lands, thus contributing to species recovery or delisting. Ecological conditions and processes that sustain habitats currently or potentially occupied by sensitive plant species are retained or restored. The geographic distributions of sensitive plant species in the Forest Plan area are maintained." (FW-DC-VEG-09, USDA 2015) Neither habitat for,

nor occurrences of, federally-listed threatened or endangered plant species is present within the BCRP proposed activity areas. Implementation of any of the BCRP alternatives would not affect currently or potentially-occupied habitat for rare plants in the long-term; all ecological processes related to those habitats would be retained. Furthermore, no known occurrences of rare plants within the project area would be affected by implementation of any of the BCRP alternatives.

There are no federally listed threatened or endangered species suspected to occur in Boundary County, Idaho (USDI 2009). Furthermore, as stated, neither habitat for, nor occurrences of, threatened or endangered plant species were observed during intensive floristic surveys of the BCRP project. Therefore, the project is consistent with the Endangered Species Act (1973) as amended.

Across the Idaho Panhandle National Forests, suitable habitat for sensitive plant species appears to be well distributed. Approximately 705,000 acres have been identified as having the potential to support sensitive plant species in a wide array of plant communities. To date, approximately 122,003 acres (about 17 percent) of suitable habitat has been surveyed for sensitive plants.

In 1998, sensitive species trends across the Idaho Panhandle Forests were qualitatively assessed (USDA Forest Service 1998, pp. 112-116). Of the sensitive plant species assessed, 11 species were considered to have fairly secure populations with stable trends and few observed threats; 28 species had mostly stable populations with some concerns and threats; and for 16 species there was a serious concern. Estimates for this assessment were based on the best information available, including known population size, distribution and threats.

The trends for sensitive moonworts ranged from stable (*Botrychium lanceolatum* ssp. *lanceolatum* [S.G. Gmelin] Angstrom) to serious concerns for population and habitat decline over time (*B. montanum* W.H. Wagner). A conservation assessment for sensitive moonworts in the Idaho Panhandle National Forests has been prepared (Evans and Associates 2005).

At the project level, and in accordance with Forest Service Manual (FSM) 2672.1-2672.43 and NFMA Section 6(g)(3)(E)(ii), suitable habitat has been identified and surveyed and the appropriate level of analysis conducted. All documented rare plant occurrences and their contiguous habitat would be buffered from all project activities under the action alternative. Protection measures for the documented moonwort occurrences are consistent with the most current scientific literature (Johnson-Groh and Farrar 2003).

# References Cited

Allen, Michael F. 1991. The ecology of mycorrhizae. Cambridge University Press. Cambridge, U.K.

Bursik, Robert J. and Robert K. Moseley. 1992. Forty-year changes at Hager Lake Fen. Idaho Conservation Data Center. Boise, Idaho. December, 1992.

Crane, M. F. and William C. Fischer. 1986. Fire ecology of the forest habitat types of central Idaho. General Technical Report INT-218. USDA Forest Service Intermountain Research Station. Ogden, UT. 85 pp. In: Fire Effects Information System. Species profile for oceanspray (Holodiscus discolor). Online at http://www.fs.fed.us/database/feis/plants/shrub/holdis/all.html.

Ellis, Mark W.; Ronald J. Taylor and Richy Harrod. 1999. The reproductive biology and host specificity of Orobanche pinorum Geyer (Orobanchaceae). In: Madrono. (46)1:7-12.

Evans, David and Associates. 2005. Conservation assessment of eleven sensitive moonworts (Ophioglossaceae; Botrychium subgenus Botrychium) on the Idaho Panhandle National Forests. Spokane, Washington.

Hammet, Anna E. 1991-2007. Personal observations of the NZ Botanist (1991-2008) concerning earliest emergence and latest spore maturity of sensitive moonworts (Botrychium subgenus Botrychium) during 17 years of rare plant surveys and monitoring on the Kaniksu portion of the Idaho Panhandle National Forests.

Harpel, Judy. 2002. Personal communication between Gifford Pinchot National Forest botanist and IPNF North Zone botanist regarding habitat requirements and abundance of Buxbaumia viridis in western Washington.

Hitchcock, C. Leo, Arthur Cronquist, Marion Ownbey and J. W. Thompson. 1959. Vascular Plants of the Pacific Northwest. Part 4: Ericaceae through Campanulaceae. University of Washington Press. Seattle, WA. Page 432.

ICDC. 2012. Idaho Dept. of Fish and Game Conservation Data Center. Element Occurrence Records contained in an electronic database. Boise, Idaho.

Johnson-Groh, C. L., and D. R. Farrar. 1989. [Abstract] Ecological monitoring of Botrychium campestre and a new species of Botrychium in western Minnesota. Unpublished report on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID.

Johnson-Groh, C. L., and D. R. Farrar. 1993. Population dynamics of prairie moonworts (Botrychium subgenus Botrychium) in Iowa and Minnesota (abstract). American Journal of Botany 80 (supplement): 109. In: Evans, David and Associates. 2005. Conservation assessment of eleven sensitive moonworts (Ophioglossaceae; Botrychium subgenus Botrychium) on the Idaho Panhandle National Forests. Spokane, Washington.

Johnson-Groh, C.L., and D.R. Farrar. 1996. [Abstract] Effects of leaf loss on moonwort ferns, Botrychium subgenus Botrychium. American Journal of Botany 83(Supple.): 127.

Johnson-Groh, C.L., and D.R. Farrar. 2003. Botrychium inventory and monitoring technical guide. Revised draft. Unpublished. 37pp.

Lawton, Elva. 1971. Moss flora of the Pacific Northwest. Hattori Botanical Laboratory. Nichinan, Miyazaki, Japan.

Lichthardt, Juanita. 2003. Conservation strategy for clustered lady's-slipper orchid (Cypripedium fasciculatum) in US Forest Service Region 1. Idaho Conservation Data Center. Boise, ID.

Lichthardt, Juanita. 2004. Conservation strategy for Idaho Panhandle peatlands. Idaho Conservation Data Center. Boise, ID.

Lux, David. 2006. Personal communication between fire management officer and NZ Botanist, Betsy Hammet (1991-2008) concerning the timing of spring burns.

Peck, J.H., C.J. Peck, D. R. Farrar. 1990. Influences of life history attributes on formation of local and distant fern populations. In: American Fern Journal 80(4): 126-142.

USDA Forest Service. 1987. Idaho Panhandle National Forests Forest Plan. Coeur d'Alene, Idaho.

USDA Forest Service. 1995. Bonners Ferry Noxious Weed Control Project Environmental Impact Statement. Idaho Panhandle National Forests, Bonners Ferry Ranger District.

USDA Forest Service. 1998. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID.

USDA Forest Service. 2003. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID.

USDA Forest Service. 2004. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID.

USDA Forest Service. 2015 Revised. Idaho Panhandle National Forests Land Management Plan. Coeur d'Alene, Idaho.

USDI Fish and Wildlife Service. 2009. Updated- Biannual Species List for the Idaho Panhandle National Forests (02/11/2009). Northern Idaho Field Office, United States Fish and Wildlife Service, Spokane, Washington. Data also available online at: http://www.fws.gov/idaho/agencies/COlists/Boundary.pdf

Weldon, L.; A.B. Bail and C. R. Graham. 2001. Conservation strategy for Botrychium pumicola (pumice grape fern) on the Deschutes, Fremont and Winema National Forests and Prineville District, Bureau of Land Management. Oregon. 22pp.

Young, Richard P. 1983. Fire as a vegetation management tool in rangelands of the Intermountain Region. In: Monsen, Stephen B; Shaw, Nancy, compilers. Managing Intermountain rangelands - improvement of range and wildlife habitats: Proceedings; 1981 September 15-17; Twin Falls, ID; 1982 June 22-24; Elko, NV. General Technical Report INT-157. USDA Forest Service Intermountain Forest and Range Experiment Station. Ogden, UT. pp. 18-31. In: Fire Effects Information System, species profile for oceanspray (Holodiscus discolor), online database at http://www.fs.fed.us/database/feis/plants/shrub/holdis/all.html